MAY 17 192[illegible]
PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

SCIENCE

NEW SERIES
VOL. LXIII, No. 1637

FRIDAY, MAY 14, 1926

ANNUAL SUBSCRIPTION, $6.00
SINGLE COPIES, 15 CTS.

GOULD AND PYLE'S

Pocket Cyclopedia of Medicine and Surgery

3rd Edition (Published 1926) Flexible Binding $2.50 $3.00 Indexed

Revised By R. J. E. SCOTT, M.A., B.C.L., M.D., New York City

It is an authoritative, compact assemblage of medical facts, concisely written and told in plain, intelligible English. Articles are alphabetically arranged. They include description of diseases, diagnosis, treatment, scientific instruments, tests, drugs, operations, etc., and tables of general scientific information.

The progress of most recent times is fully represented. This 3d edition (published 1926) has been reset entirely from new type. It contains 922 pages, printed on bible paper, 6″ by 4″ and 1″ thick. Flexible binding, $2.50. With thumb index, $3.00.

Good Health Magazine.

"It is admirably adapted to the needs of the intelligent layman who frequently runs across medical terms which are not easily understood. The selection of subjects treated has been made with such care that room has been found for everything really essential to a volume of this sort."

American Physical Education Review.

"Special provision for the needs of the reader who looks for immediate information has been made in the large number of cross references."

Alabama Baptist.

"It is admirably adapted to the needs of intelligent laymen who frequently run across medical subjects which are not understood. It contains an immense amount of information with simply-worded definitions, clear and concise explanations, and is carefully illustrated."

School Science And Mathematics.

"The information seems to be thoroughly up-to-date as indicated by the various topics of common interest and knowledge examined by the reviewer, such as typhoid fever, etc. The matter seems to be well selected and there are many handy tables."

Pacific Coast Journal of Nursing.

"The definitions are well written, and sufficient detail is given to general subjects to make them of value to the practitioner and layman alike."

Mind & Body.

"It is a book which will prove of great use to the general reader; not merely to the physician who wishes to keep informed upon medical subjects, not only in regard to those matters which may occur in his immediate family but to furnish that knowledge rendered almost necessary by the many medical discussions which appear in the newspapers of the day."

The above reviews are some that appeared on the former edition

P. BLAKISTON'S SON & CO.

PUBLISHERS 1012 WALNUT STREET PHILADELPHIA

University of
California Press

GRINNELL—SWARTH—WETMORE

A Collection of Birds from Patagonia
Collected by Pemberton and described by Alexander Wetmore. 14 illustrations. $1.25.

New Races
White-breasted Nuthatch from Lower California. 25 Cents.

Pine Martens from the Pacific Coast. 9 illustrations. 25 Cents.

The Trout of the Sierra San Pedro Martir
By John O. Snyder. 25 Cents.

Pacific Coast Brown Towhee
A Systematic Review. 2 figures in text. 25 Cents.

University of California Press
Berkeley, California

ASTRONOMY TO-DAY

By the Abbe TH. MOREUX
Director of the Observatory of Bourges

Translated by
C. F. RUSSELL, M.A.
Late Fellow of Pembroke College, Cambridge

A clear, readable account of the present position of the science, its important recent discoveries, its newly invented methods, with explanations of old problems, and an interesting account of numerous problems which still await solution.

Price, $4.00

E. P. Dutton & Company
681 Fifth Avenue, New York

Formal Logic (1847)
By **Augustus DeMorgan.** Edited by **A. E. Taylor,** Professor of Moral Philosophy at the University of Edinburgh.

A trustworthy reprint of a classical work of great value to students of logic and history of logical doctrine. Cloth. Pages 392.
Price $3.50

The Mathematical Theory of Limits
By **J. G. Leathem.** Bell's Advanced Mathematical Series.

A general outline of the theory of limits which brings together the elements of this fundamental subject in one volume. It will greatly facilitate the study of infinite series and the infinitesimal calculus. **Price $4.50**

Functions of a Complex Variable
By **David Raymond Curtiss,** Northwestern University.

Second Carus Mathematical Monograph. Now Ready. **Price $2.00**

Send for complete catalog

OPEN COURT PUBLISHING COMPANY
122 South Michigan Avenue CHICAGO, ILLINOIS

FIRST COLLOID SYMPOSIUM
Monograph

A few copies of the Monograph containing the papers presented at the First Colloid Symposium held at Madison, Wisconsin, in June, 1923, are still available. You will want a complete file of these Monographs.

23 papers. 419 pp. $2.75 (postpaid)

Orders should be sent to

THE UNIVERSITY CO-OPERATIVE COMPANY
Madison, Wisconsin

SCIENCE

VOL. LXIII MAY 14, 1926 No. 1637

CONTENTS

The History of Organic Evolution: DR. JOHN M. COULTER 487

Barro Colorado Island Biological Station: DR. VERNON KELLOGG 491

Douglas Stewart: W. J. H. 493

Scientific Events:

Award of Prizes by the Royal College of Surgeons; The Fifth International Conference of Soil Science; Installation of a Chapter of Sigma Xi at Cincinnati; Award of Medals by the Franklin Institute 494

Scientific Notes and News 496

University and Educational Notes 499

Discussion and Correspondence:

The Albatross II: DR. HENRY B. BIGELOW. *Spermatogenesis in Icerya Purchasi:* S. HUGHES-SCHRADER. *The Nomenclature of Organic Compounds:* PROFESSOR PAUL M. DEAN. *Domestic Cats for Dissection:* PROFESSOR A. M. REESE. *The Proposed Ransom Memorial:* ELOISE B. CRAM 500

Scientific Books:

Joly's Surface History of the Earth: PROFESSOR CHARLES SCHUCHERT 502

Special Articles:

The Differentiation of Herpetomonads and Leishmanias by Biological Tests: DR. HIDEYO NOGUCHI. *Gyromagnetic Electrons and a Classical Theory of Atomic Structure and Radiation:* PROFESSOR LOUIS V. KING 503

The National Academy of Sciences 505

Science News x

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 8, 1879.

THE HISTORY OF ORGANIC EVOLUTION[1]

THE meaning of evolution is probably more misunderstood than any doctrine of science. The reason is that it has been discussed very freely by those who are not informed, and in this way much misinformation has been propagated.

The general meaning of organic evolution is that the plant and animal kingdoms have developed in a continuous, orderly way, under the guidance of natural laws, just as the solar system has evolved in obedience to natural laws.

There are at least three important reasons why evolution should be regarded as a necessary part of college training.

(1) It has revolutionized modern thought. Every subject to-day is being attacked on the basis of its evolution. Not only are inorganic and organic evolution being considered, but also the evolution of language, of literature, of society, of government, of religion. In other words, it is a point of view which represents the atmosphere of modern investigation in every field.

(2) It is persistently misunderstood. From the press, the lecture platform and even the pulpit, one frequently hears or reads amazing statements in reference to organic evolution. If it were made an essential feature of student training, there would be developed a propaganda of information instead of misinformation.

(3) It has revolutionized agriculture. The practical handling of plants and animals, in the way of improving old forms and securing new ones, was made possible and definite when the laws of inheritance began to be uncovered through experimental work in evolution.

PERIODS IN THE HISTORY OF EVOLUTION

There have been three distinct periods in the history of evolution, based upon the method of attack. These three methods may be spoken of in general as speculation (ancient), observation and inference (medieval) and experimentation (modern).

[1] Lecture delivered at a joint meeting of the New York Association of Biology Teachers, the Chemistry Teachers Club of New York, the Physics Club of New York, and the Torrey Botanical Club, at the Hotel Majestic, New York City, on March 27, 1926, and arranged under the direction of the Science Committee of the Board of Education.

(1) *Speculation:* The idea of organic evolution is as old as our record of men's thoughts, for all the old mythologies are full of it. No modern man, therefore, is responsible for the *idea,* although it is a common misconception to load this responsibility upon certain distinguished modern students of evolution. For example, the name of Darwin is so conspicuous in connection with evolution that many seem to think that Darwinism and evolution are synonymous. Until 1790, however, organic evolution was a pure speculation, with no basis of scientific work. It should be emphasized that the *idea* of evolution has always been present in the mind of man.

During the latter part of this ancient period of speculation, certain facts began to be observed that made some thinking men conclude that evolution might be a fact, and not merely a speculation. It will be helpful to note briefly, in historical succession, the kind of facts that set these men to thinking, and that resulted in the second period in the history of evolution, when it became a science.

In classifying plants and animals, which was the initial phase of biology, men rigidly defined the different species, the thought being that the different kinds had descended in unbroken succession "from the beginning," whenever that may have been. When more extensive observations were made in the field, numerous intergrades began to be found. The species, as defined, seemed to intergrade freely. In other words, the pigeon-hole arrangement, with rigid partitions, did not express the facts. It became evident that species had been defined by man rather than by nature. Some were distinct enough, but many intergraded. This intergrading suggested that one species might come from another, the intergrades marking the trail.

The next observations suggesting that evolution might be a fact had to do with what was called the "power of adaptation," which we now call "responses." It was observed that plants and animals respond to changes in environment, often in a striking way. I have seen what were regarded as two good species changed into one another by changing from a moist habitat to a dry one, or the reverse. This ability to respond to changing conditions seemed to indicate that species are not so rigid and invariable as had been supposed.

As technique developed, and the internal structures of plants and animals became known, it often happened that rudimentary structures were found, which never developed to a functioning stage, but which occurred fully developed in related forms. For example, it was found that in the developing parrot a set of embryo teeth begins, but never matures. The inference was natural that these structures had been functional in the ancestors, but had been abandoned by some of their descendants. In these days, it has become the habit to call these rudimentary structures "vestiges." Many such illustrations could be given. One in the human body is the vermiform appendix. It seems safe to say that we are walking museums of antiquity.

As technique developed still further, the embryology of plants and animals began to be studied in detail, the whole progress from egg to adult being observed. In very many cases, during this progress, glimpses of fleeting structures and resemblances were obtained, which had disappeared when the adult stage was reached, but which related the form to other species.

After this succession of facts, there came a revelation which convinced more men that evolution is a fact than any evidence which had preceded. The geologists had begun to uncover that wonderful succession of plants and animals from the earliest geological periods to the present time. They saw in the oldest periods forms unlike any now existing; they saw gradual changes with each succeeding horizon; they saw a steady approach to forms like those of to-day, until by insensible gradations the present flora and fauna were ushered in. This geological record, becoming continuously more detailed in its interpretation, set men to thinking seriously.

Finally, after all this evidence was in, men began to look around them and to realize what they had been doing for centuries in domesticating animals and plants. They had been bringing them from the wild state and changing them so much by the methods of culture that in many cases the wild originals could not be recognized. Most of our cultivated plants, if found in nature associating with their wild originals, would be regarded as extremely distinct species.

In the presence of such an array of facts, is it to be wondered at that certain men began the serious, scientific study of evolution? As a result, the second period in the history of evolution was ushered in, and evolution became a science.

(2) *Observation and inference:* In time, this period extends from 1790 to 1900. It is characterized by the appearance of a succession of explanations of evolution. It is important to remember that the men who offered these explanations are not responsible for the *idea* of evolution, but merely attempted to explain the *fact* of evolution. They were explainers rather than authors. It is also important to realize the method used. It may be called the method of comparison and inference. Plant and animal forms were observed, and resemblances were assumed to indicate relationship through descent. It was not dem-

onstration, but inference based on observation. Darwin carried the method to the limit of its possibilities, observing not a small range of forms, but observing through several years a world-wide range of forms, in connection with the famous voyage of the *Beagle*. His caution is also indicated by the fact that his observations were under consideration for some twenty years before his conclusions were published.

This second period in the history of evolution, which we may call the medieval period, is marked by the appearance of several explanations. I shall mention only the three most conspicuous ones, and there is no need to define these in detail.

The explanation which ushered in the period was proposed simultaneously and independently in 1790 by Goethe, of Germany, St. Hilaire, of France, and Erasmus Darwin, of England. Observations of responses to changed environment led them to the conclusion that environment is the direct cause of change, actually molding forms. This evolutionary factor, therefore, is entirely external to animal or plant. It was a natural first explanation, but of course it was too superficial, and environment as a *direct* cause of evolution soon passed into the historical background. It deserves mention only because it was the first attempt at an explanation. In 1801 Lamarck, in a series of lectures, announced his explanation, calling it the theory of "appetency." This was really the first explanation with a body of doctrine, and hence Lamarck has often been called the "founder of organic evolution." The term "appetency," however, has been abandoned, and its real meaning expressed by the phrase "the effect of use and disuse." With Lamarck, environment is not the direct *cause* of the change, according to the earlier explanations, but the *occasion* for the change. The cause is the striving, the effort to do something that had become necessary. Thus organs would become developed as a consequence of some change in environment calling them into use; and, conversely, organs would gradually become aborted as a consequence of some change in environment that eliminated their use. This explanation rests absolutely upon the inheritance of acquired characters, meaning characters not inherited by the possessor, but acquired during the life of the individual.

In 1858 the epoch-making explanation of Darwin was announced, an explanation which was dominant for about fifty years. It is too familiar to need explanation. In brief, it claims that nature selects among variations, that the method of selection is competition, that the result is the destruction of the relatively unfit, or as Spencer puts it, "the survival of the fittest." In brief, the theory is really an explanation of what is called adaptation.

As facts multiplied, the current explanations of evolution were found to be inadequate to explain some of them. This led to a general misunderstanding of the situation by the uninformed public. For example, more intensive study developed the fact that Darwin's explanation does not always explain. His name is so identified with evolution in public thought that this criticism of the universal application of his conclusions by certain scientific men was taken to mean that the theory of evolution was being abandoned. The real situation is that every proposed *explanation* may prove inadequate, and yet the *fact* of evolution remains to be explained.

All the explanations offered are partial explanations, which simply means that no one of them applies to all the facts. We need them all and more besides. So far from being abandoned, evolution is the basis of all biological work to-day.

The method of comparison and inference continued until the beginning of the present century. Then came a new epoch in the history of evolution.

(3) *Experimentation:* This may be called the modern period, in contrast with the medieval and ancient periods. It was ushered in by the work of DeVries, who introduced the experimental study of evolution, and announced his explanation of evolution by means of *mutation*. The problem was to discover whether one species actually produces another one. It had been inferred that it does, but inference is not demonstration. By means of carefully controlled pedigree cultures, DeVries discovered a plant in the actual performance of producing occasionally a new form among its numerous progeny. This form bred true and preserved its distinctive characters; in other words, it was a new species or at least a different species from its parent. Many such species have now been observed originating in this way, both in plants and animals. That one species can produce another one is no longer inferred, but demonstrated, and demonstrated repeatedly. There is no longer any doubt, therefore, that evolution is a *fact*. It is quite a different question whether the proposed explanations are adequate.

When inferences were the only results, in the medieval period of evolution, it was natural to extend inference to the evolution of the plant and animal kingdoms, and this involved the origin of man. In these days there is no such attempt, for experimental demonstration of the evolution of the whole series of organic forms, culminating in man, is clearly impossible. Biologists, therefore, are no longer concerned with the whole story of evolution, but only in discovering experimentally how one species may produce another one. The *fact* of evolution is estab-

lished, but the whole story of evolution must remain an inference.

PRESENT STATUS OF EVOLUTION

Only a very general statement can be made of the present status of evolution, since a full statement would involve an extensive discussion. The experimental study of evolution has led to the development of the field of genetics ("heredity"), a subject which has grown with remarkable rapidity. It is genetics which must uncover the machinery of evolution, which of course is fundamentally a matter of inheritance. The facts thus far uncovered indicate complexities which were not realized before, but which should have been anticipated, for inheritance, with its resulting evolution, represents the most complex biological situation imaginable.

The present status of evolution as a body of doctrine may be said to be in a state of flux, out of which the truth will emerge eventually. Any meeting of biologists at which evolution is discussed discloses considerable diversity of opinion, not as to the *fact* of evolution, but as to some attempt to explain the process.

It is evident, of course, that whatever produces variation furnishes a basis for evolution. But what produces variation? Environment is one factor; sex is another factor, especially when strains are crossed; and other factors might be cited. Any factor claimed to induce variation must stand the test of genetics. Variations, however produced, are of two general kinds, as indicated by behavior, namely, the so-called continuous variation of Darwin's explanation, and the so-called discontinuous variation of DeVries's explanation. The differences of opinion have to do with the method of variation production, that is, variation that may result in a new species.

After such variation is secured, there is no question as to the function of selection. It is merely a statement of fact to say that some variations persist and some are eliminated. It is a very different matter to claim that only the "fit" persist. In some way the selection is made, and the selection factors may be quite variable. In general, it may be said that there is no serious difference of opinion that evolution is based on variation and subsequent selection. It is only a matter of detail to determine the exact factors.

There is a much more serious problem of evolution, however, which is still baffling. The variations observed, which result in new species, as tested by genetics, and for which the cytological machinery has been observed, produce species either laterally or retrogressively; that is, species of the same rank or of declining rank. There is as yet no adequate explanation of progressive evolution, the advance from one great group to another of higher rank. Progressive evolution is a very evident fact, as shown by many an impressive series disclosed by the geological records. The theory of "orthogenesis" is often cited as an attempt to explain progressive evolution. Orthogenesis is not an explanation, however, but a name for progressive evolution. The fact remains to be explained. The multiplication of species is within the reach of experimental study as to causes and methods, and the results are leading to conclusions that may vary with the investigator, but which will be checked up by further investigation. The progressive advance of species, however, is still within the region of inference. It is something like the difference between the tracks in a switch-yard and the main line. We have succeeded in investigating the switching, but the through trains are baffling.

PRACTICAL RESULTS

I wish now to call attention to the practical results that the study of evolution has made possible. The experimental study of evolution, leading to the development of the science of genetics, resulting in increasing knowledge of the laws of inheritance, has led to practical results which the public in general do not appreciate. I shall select only one illustration from very many, but it will serve to indicate the sort of service the study of evolution has rendered in a practical way, in addition to its service in the advancement of knowledge. I have selected the revolution in agriculture. It seems a far cry from speculations concerning evolution to a revolution in agriculture, but the continuity is unbroken. Speculation led to observation; observation led to experimentation; experimentation resulted in discovering laws of inheritance; and the application of these laws has enabled us to handle plants and animals in a way that was never dreamed of before. It is a good illustration of the fact that there is no sharp dividing line between what are called pure science and applied science, for pure science may prove immensely practical.

A very brief statement will illustrate the agricultural results in the application of our knowledge of inheritance. It had become evident, for example, that for various reasons the ratio of increase in population was much greater than the ratio of increase in food production. The statement was made that during the ten years preceding the great war our population had increased 20 per cent. and our food production about 1 per cent. It was certainly an alarming outlook. Under these circumstances, plant crops began to be studied from the standpoint of genetics, and plant breeding became a science.

The lack of crop production arose chiefly from three causes, namely, lack of adaptation of crops to environment, destruction by drought and destruction by disease. The same races were being cultivated everywhere, and only in certain places was the maximum result obtained. A study of races of crop plants throughout the world, and of the environment necessary for maximum yield, resulted in such an adjustment of crops to conditions that total food production was enormously increased.

The problem of drought is being rapidly solved by the discovery or development of drought resistant races, not only insuring against loss from this cause, but also enormously increasing the possible area of cultivation.

The problem of disease has been attacked in the same way, and disease resistant races of most of the important crops have been developed, much reducing loss from this source. As a result, food production is now beginning to overtake population, and we may thank the persistent study of evolution for the result.

To summarize the present situation in reference to evolution, the following statements may be made. Biologists are testing the earlier conclusions by means of the multiplying facts. They are continually discovering factors which complicate the situation. They must learn the influence of factors by experimentation. As a result the problem of evolution has been discovered to be very complex, not to be explained so simply as had been supposed, and therefore is still "in the melting pot," as a distinguished scientist has remarked. All this means, however, that although this difficult problem has not been solved in all its details, it is still recognized by every biological investigator as a problem to be solved. It is not the fact of evolution that is being tested, but the explanation of evolution.

JOHN M. COULTER

BOYCE THOMPSON INSTITUTE,
YONKERS, N. Y.

BARRO COLORADO ISLAND BIOLOGICAL STATION

THE National Research Council has received the second annual report of the Executive Committee of the Institute for Research in Tropical America, prepared by Dr. Thomas Barbour, acting chairman of the committee. From this report I submit the following extracts that the readers of SCIENCE may be informed of the conditions and activities at the Barro Colorado Island Biological Station in the Panama Canal Zone.

The past year, reports Dr. Barbour, has been even more eventful and full of promise for the future than was the first. The officials of the Panama Canal and of the army have continued their invaluable and sincere interest and to them our thanks are heartily offered. Dr. Zetek and his assistant, Mr. Molino, have both continued their constant and efficient devotion.

The main laboratory building has been considerably altered. In the first place the kitchen has been removed to a new separate 12′ x 12′ building connected with the rear of the main house. The latter has been improved by the addition of more window space and by the partitioning off of the sleeping quarters. The area beneath the building has been provided with a concrete floor and has been walled in and screened, thus making an additional study connected by a stairway to the floor above. This now serves as shop, dining room and a place where certain sorts of scientific work, such as gross dissections, may be more conveniently carried on than in the laboratory upstairs. Beside the kitchen, a fuel house and a screened building 12′ x 24′ to serve as laborers' quarters has been finished and is in use.

The total length of trails now cut through the jungle is about twelve thousand meters and many small bridges have been built across some of the steepest ravines.

A Decauville railway track with steel cable, winch and car now makes it possible to hoist baggage, provisions and heavy equipment from the wharf to the laboratory in about twenty-five minutes, thus obviating the heavy labor previously involved when all material had to be carried up the 180 steps leading to the station from the lake level.

Thanks to the continued generosity of Mr. Barbour Lathrop, the station at last has an adequate launch. This craft is 26′ long, 9′ beam and draws 3′ 6″. She is well engined and safe and capable of going anywhere about Gatun Lake. Indeed, she has made trips up the Pacific Coast as far as Pedregal in the Province of Chiriqui, about three hundred nautical miles distant from Balboa at the Pacific entrance of the Canal. She has been named the "Barbour Lathrop."

Thanks to the generosity of Dr. F. M. Chapman, we have an additional new dugout canoe for work about the island shores. The old skiff with outboard motor is now kept at the island; the launch being at Frijoles.

Thanks also to Dr. Chapman's generosity, several "Cambridge Cans" such as are used in museums for the storage of bird skins have been placed in the laboratory and we plan generally to accumulate a study series of a pair of each species of bird found on the island. This will aid students in identifying the species. At present collecting is strictly limited to the taking of birds absolutely needed to check identification of species upon which intensive life his-

tory studies have been made. A special permission is necessary to take any of the terrestrial species, as these are particularly subject to the ravages of predatory animals. There is some indication that some mammals, especially the "Gato Solo," or Nasua, and some of the cats, may be abnormally abundant.

Twenty-two animal cages of several sizes, some large, are now available to house animals while under observation. In addition to these, twelve insect-breeding cages have been added to the permanent equipment.

Thanks to Dr. Van Name's generosity, we have received twenty-five reprints of his recent paper on forest isopods of the island, in which many new species are described. Since many papers are now constantly appearing on the result of studies made on the island, it is earnestly hoped that authors will supply at least two copies to the office of the resident custodian; the address is Box 245, Ancon, Canal Zone.

We have now, in a dry closet at Mr. Zetek's office, a superb set of the Biologia Centrali-Americana, thanks to Mr. Barbour Lathrop's generosity. It is earnestly hoped that some other kind friend may see fit to present the station with the volumes of reports of the French "Mission Scientifique au Mexique."

Thanks to the continued interest of the United Fruit Company, five annual passes were again awarded by the National Research Council, upon recommendations of the Executive Committee of the Institute for Research in Tropical America, to workers bound for the island, the only expense being five dollars per day for subsistence. By order of the secretary of war, the quartermaster general of the army is authorized to assign space on army transports bound for the Canal Zone, when such space is not needed for officers of the United States Army. The Panama Canal allows to properly accredited scientists the fifty dollar rate on the Panama Railroad steamers, a pass on the Panama Railroad and right to purchase from the Canal Commissaries and to occupy quarters in the government halls at the same rates as these facilities are extended to employes of the Panama Canal.

The following biologists worked at the station since the date of the last report. More naturalists are using the island station than any other tropical research institution in America.

Mr. H. K. Adams, research fellow under Professor W. M. Wheeler, of Harvard University, spent some months in the Zone at Ancon and at the station studying ticks and blood parasites.

Professor Guy R. Bisby, of the Manitoba Agricultural College, studied the rust fungi, woody fungi and slime moulds, finding abundant material.

Dr. Frank M. Chapman, of the American Museum of Natural History, not only provided our office in Ancon with abundant and most valuable notes concerning the more than 140 species of birds which he observed on the island, but he took back with him to the museum in New York material for a large habitat group showing a characteristic bit of the island jungle with Gatun Lake in the background and some of the characteristic birds and plants. Dr. Chapman chose the island after long consideration as affording a perfectly typical bit of the American Lower Tropical Zone, and a site which will become increasingly familiar to all students of neotropical zoology. Dr. Chapman was accompanied by Mr. Francis L. Jacques, artist, and Mr. Raymond B. Potter, preparator. Dr. Chapman has offered to build a dwelling house near the laboratory which he will present to the station with the understanding that he will have the use thereof when he visits the island in the future. As additional sleeping quarters are frequently needed, his offer has been very gratefully accepted. Dr. Chapman insists, however, that he be allowed to pay the same rate for subsistence now charged to other workers at the station.

Professor Carroll W. Dodge, of the Farlow Herbarium, Harvard University, made large collections for future study of some of the obscure groups of Cryptogams concerning which he is an authority.

Dr. Fred M. Gaige, of the University of Michigan, is now at the station studying especially the social insects.

Professor Alfred O. Gross, of Bowdoin College, Brunswick, Maine, spent the summer at the station. His investigations consisted of careful and long continued observation from blinds at the nests, and extensive photographic records, detailed continuous records of weights and measurements of young, flesh colors, etc., of six species of little known neotropical birds. This work is so much more complete and painstaking than anything of the kind done before that it sets a new standard. No less than three hundred and fifty beautiful negatives were secured.

Mr. William T. Harris was sent by Dr. Ruthven, of the Museum of Zoology, University of Michigan, to make flashlight photographic studies of various nocturnal animals.

Dr. Harold Kirby, of Yale University, studied the protozoan fauna of the intestinal tract of the termites. A large number of new genera and species were found.

Dr. Maynard M. Metcalf, of the Johns Hopkins University, and formerly chairman of the division of biology and agriculture of the National Research Council, made a general inspection of the island and continued his studies on the protozoa inhabiting the intestinal tract of the amphibia.

Dr. Curt P. Richter, of the Johns Hopkins University, Baltimore, Maryland, continued his studies be-

gun at the station last year in experimental physiology, using as subjects the sloths and monkeys.

Mr. Paul C. Standley, of the U. S. National Herbarium, Washington, D. C., spent some time at the station in connection with his forthcoming "Flora of the Canal Zone." Mr. Standley collected many plants which are rare or little known, and has promised that one of his future labors will be the preparation of a "Flora of Barro Colorado Island." This is no light task, but it will be an invaluable aid to every naturalist who visits the station.

Dr. Charles W. Townsend, ornithologist, of Ipswich, Massachusetts, visited the station and subsequently wrote a most entertaining and vivid description of the island and some of the more conspicuous birds for the *Harvard Graduate Magazine*.

Mr. Josselyn Van Tyne, of the University of Michigan, was associated with Professor Gross during his studies already mentioned and is now again at the station to continue his work.

Professor George B. Wislocki, of the Johns Hopkins University, studied the anatomy, and especially the genito-urinary systems, of the sloths and monkeys, supplementing Dr. Richter's studies. He has already published a work on the placentation of Bradypus.

Professor Charles Woodworth, of the University of California, studied several groups of insects in which he is especially interested. In this work he was assisted by his son, Professor Charles E. Woodworth, of Modesto Junior College, Modesto, California.

In addition to the above there were many visitors to the station, among them Dr. George T. Moore, director of the Missouri Botanical Gardens, St. Louis. After visiting the station, Dr. Moore promised that the Missouri Gardens would become a regular contributor to the support of the station. Regular annual contributions from universities, scientific institutions or societies and individuals are much needed. The committee in charge of the station will be glad to make special arrangements for investigators representing contributing institutions.

VERNON KELLOGG

NATIONAL RESEARCH COUNCIL

DOUGLAS STEWART

AT sunset on April 21, 1926, Dr. Douglas Stewart, director of the Carnegie Museum, died at his home, 5816 Solway Street, Pittsburgh, in the fifty-third year of his age.

He was born in the city of Pittsburgh on July 15, 1873, the son of the late David Alexander and Nancy (*m. n.* Scott) Stewart. His father was one of the earliest partners of Mr. Andrew Carnegie, and at the time of his death, December 13, 1888, was chairman of the board of directors of the Carnegie Steel Company. His mother was a niece of the late Col. Thomas A. Scott, president of the Pennsylvania Railroad Company. His ancestors on both sides were of Scotch extraction. For several generations they had lived in western Pennsylvania.

Mr. Stewart was prepared for college at the Shadyside Academy in Pittsburgh. He took his degree as Bachelor of Arts at Yale in the class of 1896. The two years following graduation were spent in foreign travel. He visited the various capitals of western Europe and continued his journeys to Algeria and Egypt. In the latter country he made a considerable stay and became deeply interested in the memorials of the ancient civilization of the land. The interest then aroused continued through his entire later life.

Upon his return from abroad he was at the suggestion of Mr. Carnegie appointed as an assistant in the office of the director of the Carnegie Museum. He held this position continuously from 1898 to 1919. His attendance upon his duties at the museum during this period was only interrupted by occasional journeys, as in 1902, when he spent the summer in Europe, accompanied by his bride, and in later years, when he visited various parts of America in quest of recreation or information. In the year 1918–1919 he was granted leave of absence for a twelve-month, which he spent in Washington, D. C., serving as associate director "in charge of prisoners" in the American Red Cross. In this capacity he rendered eminently successful service, and at the close of the World War was invited to undertake the oversight of the affairs of the American Red Cross in Europe. He declined the invitation and, returning to Pittsburgh, was appointed assistant director of the Carnegie Museum. In the early summer of the year 1922, when the then director of the museum became director emeritus, Mr. Stewart was elected to the directorship, in which position he has remained until his sudden and untimely death.

During the all too short years of his service as director he was very successful in efforts to popularize the institution and initiated various series of lectures and established numerous classes for pupils in the different grades in the schools of the city, which have been exceedingly well attended. He devoted himself with enthusiasm to promoting the activities of the institution along lines which had already been established for the advancement of scientific research and the diffusion of knowledge. Having as a student at Yale taken a special course in mineralogy under Professor Edward S. Dana, he felt strongly drawn to this field of inquiry, and during his entire connection with the museum served as the curator of the mineralogical as well as of the archeological collections which were being acquired by the institution. In

June, 1924, the University of Pitsburgh conferred upon him the honorary degree of Sc.D. in recognition of his attainments and services to the community.

Dr. Stewart accompanied by his family spent the summer of the year 1925 in European travel, and visited the leading museums of London, Cambridge, Paris, Brussels and Berlin. He was everywhere received with the greatest courtesy. He returned apparently greatly invigorated by his trip and full of ideas bearing upon the future of the institution of which he was the head.

Dr. Stewart was a member of the American Archeological Society, a member of the American Association of Museums, serving at the time of his death as one of the governing Council, he was a fellow of the American Association for the Avancement of Science. He was an active member of many of the scientific societies in Pittsburgh. For a long time he served as president of the Stage and Play Society in Pittsburgh. After his return from Washington he accepted the duties of chancellor of the Belgian Consulate in Pittsburgh under the appointment of his chief, Dr. Holland, who from 1918 to 1922 was the Consul for Belgium for western Pennsylvania.

Mr. Stewart added to his other accomplishments a good knowledge of music, and was a proficient violinist. He possessed a happy and cheerful disposition and was a favorite in the social circles in which he moved. He was devoted to his family and was most happy in his home, where his gracious wife and he loved to entertain a wide and interesting circle of friends and acquaintances.

He left his office on the evening of Thursday, the 15th of April, apparently in good health and the best of spirits. On the following day he was reported from his home as being slightly indisposed. He took to his bed, but no special anxiety was felt until in the evening of Tuesday, April 20, when alarming symptoms suddenly developed. He died of heart failure on the evening of the following day. His funeral took place at Calvary Protestant Episcopal Church on Friday, April 23, at 3:00 p. m., Rt. Rev. Alexander Mann, Bishop of the P. E. Diocese of Pittsburgh, officiating. He is buried in Allegheny Cemetery.

He leaves his wife and two young daughters and an innumerable company of friends to mourn his loss. He lived a noble, useful and inspiring life, and was "every inch a gentleman." His death ends a career which was full of the richest promise for the future, and inflicts a heavy loss, not only upon the institution which he so long and faithfully served, but upon the cause of science in America.

W. J. H.

SCIENTIFIC EVENTS

AWARDS OF PRIZES BY THE ROYAL COLLEGE OF SURGEONS

AT a quarterly meeting of the council of the Royal College of Surgeons of England on April 15, as already recorded in SCIENCE, the Walker Prize of £100 was awarded to Dr. William Ewart Gye in recognition of his work in advancing the knowledge of the pathology and therapeutics of cancer during the past five years. The award was made in pursuance of the following report from the committee appointed to advise the council in the matter:

> The work of Dr. Gye, which has been very materially assisted by the optical researches of Mr. J. E. Barnard, F.R.S., promises to throw light upon the hitherto unsolved problem of the causation of malignant disease. Taking as his starting-point the pioneer work of Peyton Rous upon fowl sarcoma, Dr. Gye produced from this tumor, by different methods, two fluids. Neither of these fluids when inoculated alone produced a tumor, but an inoculation of the mixed fluids in a healthy fowl was followed by the appearance of a sarcoma. The experimenter inferred in his further work that to produce a malignant growth two factors are necessary, first a living virus which appears to be of extreme minuteness, and secondly a chemical factor peculiar to each species of animal and effective only in that species. Dr. Gye has succeeded in cultivating this virus *in vitro*. Further, by a series of substitution experiments, he has shown that there can be obtained from human carcinoma and from malignant tumors of the rat and mouse a virus capable of acting with the "specific factor" of the fowl to cause fowl sarcoma.
>
> These experiments, pursued with great patience and acumen over a long period and still in progress, suggest new and hopeful lines of attack upon the problem of the cause of malignant disease. Though it can not yet be said that they have found practical application, they have already given to cancer research such a great stimulus, and such a new direction, as to justify the committee in recommending Dr. Gye for the Walker Prize.

The Cartwright Medal, with an honorarium of £85, was awarded to Dr. James Sim Wallace, L.D.S., for his essay on "Variations in the Form of Jaws with Special Reference to their Etiology and their Relation to the Occlusion of the Dental Arches." The subject for essays for this prize for 1926–30 will be "The Etiology, Pathology, and Treatment of Periodontitis."

THE FIFTH INTERNATIONAL CONFERENCE OF SOIL SCIENCE

FOREIGN governments will be invited by the United States to be represented by delegates at the Fifth International Conference of Soil Science to be held

at Washington, D. C., during 1927, as the result of Congressional action authorizing such invitations.

The first international conference of soil science was held at Budapest in 1908. Prior to that conference the scientists met in international conference as a branch of the International Congress of Geologists. The second conference took place at Stockholm, Sweden, in 1910, and at that meeting it was agreed to hold the third conference in St. Petersburg, Russia, in 1913. Owing to the difficulties in Russia during the summer of 1913, the Russian government requested the representatives of the soil scientists of that country to notify affiliated bodies in other nations that it would be inconvenient to hold a conference in Russia at the time scheduled. The third conference finally met at Prague in April, 1922, and the fourth conference at Rome in May, 1924.

The International Conference of Soil Science is made up of specialists from a number of countries in which soil investigations are carried on in an intensive way. The conference is concerned with the establishment, through discussion and agreement, of uniform methods of procedure in the handling of soil problems of like character in all the countries represented, with the aim of eventually effecting a correlation of the soils of the whole world.

It is believed by the Department of Agriculture that the holding of such a conference in the United States will prove especially advantageous in promoting this branch of science, since a much larger number of American representatives interested in soil science, both those associated in Federal government activities and those connected with state colleges and other institutions in work along these lines, will thereby be enabled to participate in the conference and benefit by the exchange of ideas with the leading students of soil problems in foreign nations concerning the latest developments in experimental, educational and teaching work.

No expense will be incurred by the government in extending invitations to the delegates of foreign countries, but probably an appropriation of a small sum, not exceeding $5,000, will be requested in the future by the Department of Agriculture for the publication of the proceedings and reports of the conference and for miscellaneous printing items, as was done by the governments of other countries in which the previous meetings have taken place.

INSTALLATION OF A CHAPTER OF SIGMA XI AT CINCINNATI

INSTALLATION of a chapter of Sigma Xi at the University of Cincinnati took place on April 29, in the woman's building at the University of Cincinnati. Dr. Forrest R. Moulton, of the University of Chicago and president of the National Society, and Dr. H. P. Ward, of the University of Illinois, former president of the society and acting for the national secretary, were the installing officers.

Following the installation, a banquet was held where the address of welcome was given by Dr. Frederick C. Hicks, president of the University of Cincinnati. Dr. H. M. Benedict was toastmaster. Responses were made for the chapter by Dr. Nevin Fenneman and by Dr. Herman Schneider, dean of the College of Engineering. Dr. Ward gave a short address on "Yesterday and To-morrow," being a discussion as to the history and objects of the society. The main speaker was Dr. Moulton, who gave an illustrated address on modern ideas in astronomy.

The officers of the new chapter are:

President: Dr. O. C. Von Schlichten, Department of Geology.

Vice-president: Dr. G. D. McLaughlin, Department of Leather Research, Tanners' Council of America.

Secretary-treasurer: Dr. Saul B. Arenson, Department of Chemical Engineering.

The petitioning group consisted of about forty, practically all being members elected at other chapters.

AWARD OF MEDALS BY THE FRANKLIN INSTITUTE

A SPECIAL meeting was held at the Franklin Institute on May 12 when medals were presented in accordance with the following program.

Presentation of the Longstreth Medal to Mr. James John Denny, MacIntyre Porcupine Mines, Ltd.

Presentation of the Wetherill Medals to Mr. Frank Twyman, F.R.S., F.Inst.P., managing director, Adam Hilger, Ltd.; The Wagner Electric Corporation, Mr. W. A. Layman, president.

Presentation of Levy Medals to Mr. Frank W. Peek, Jr., General Electric Company; Professor Ernest G. Coker, D.Sc., F.R.S.E., University of London.

Presentation of Cresson Medals to Dr. George Ellery Hale, Ph.D., D.Sc., LL.D., honorary director, Mt. Wilson Observatory; Dr. Charles Sheldon Hastings, Ph.D., professor emeritus of physics, Yale University.

Presentation of the Franklin Medal and Certificate of Honorary Membership to Professor Niels Bohr, Ph.D., director of the institute for theoretical physics, Copenhagen, Denmark. Received by the Minister of Denmark to the United States.

Presentation of the Franklin Medal and Certificate of Honorary Membership to Samuel Rea, Sc.D., LL.D., former president, Pennsylvania Railroad.

A paper by Professor Niels Bohr on "Atomic Structure" was presented by Dr. Karl T. Compton. Mr. Samuel Rea gave an address on "Engineering Reminiscences."

SCIENTIFIC NOTES AND NEWS

THE Pulitzer prize committee has awarded its $1,000 prize for "the best American biography teaching patriotic and unselfish services to the people" to Dr. Harvey Cushing's "The Life of Dr. William Osler."

DR. THEOBALD SMITH, of the Rockefeller Institute, has been awarded the George M. Kober medal by the Association of American Physicians. The medal is given annually to the physician judged to have made the most important contribution to medical scientific knowledge during the year.

UNDER the compulsory retirement rules of the University of Illinois, Professor William Trelease, who has been head of the department of botany since 1913, will retire from active service this year, being succeeded by Dr. Homer L. Shantz, now of the U. S. Bureau of Plant Industry of the U. S. Department of Agriculture. Professor Trelease, who has monographed such large and difficult genera as Agave, Phoradendron, Quercus and Yucca, expects to devote his time to similar studies of the Piperaceae.

DR. H. A. B. DUNNING, of Baltimore, has been awarded the Remington honor medal of the New York branch of the American Pharmaceutical Association for "the most conspicuous service of the year to American pharmacy."

AT the annual meeting of the Boston Society of Natural History the annual award of the Walker prize in natural history was made to Ernest G. Holt, of the Carnegie Museum, Pittsburgh, Pa., for a paper entitled "On the Status of *Ardea occidentalis* Audubon and *Ardea würdemanni* Baird." This year's prize was offered for the best memoir submitted on any subject in the field of ornithology.

DR. CHARLES POLLARD OLIVIER, associate professor of astronomy of the University of Virginia, was awarded the President and Visitors Research Prize of $100 in gold, at the joint meeting of the Virginia Academy of Science and the university chapter of Sigma Xi, on May 7, for his book entitled "Meteors."

PROFESSORS NIELS BOHR and Max von Laue have been elected foreign corresponding members of the Vienna Academy of Sciences.

SIR NAPIER SHAW, formerly director of the Meteorological Office, London, has been elected an honorary member of the Norwegian Academy of Sciences, in the class for mathematics and natural science.

AT the eighth annual meeting of the American Society of Mammalogists, held at the American Museum of Natural History in New York City from April 27 to May 1, the following officers were elected: *President*, W. D. Matthew; *first vice-president*, G. M. Allen; *second vice-president*, H. E. Anthony; *recording secretary*, H. H. Lane; *corresponding secretary*, A. Brazier Howell; *treasurer*, A. J. Poole. The 1927 meeting will be held in Philadelphia.

REV. JAMES B. MACELWANE was elected chairman of the eastern section of the Seismological Society of America at the first meeting of the society in Washington. The other officers elected were: Ernest A. Hodgson, vice-chairman, and Nicholas H. Heck, secretary and treasurer.

THE American Association of Physicians meeting in Atlantic City has elected the following officers: *President*, Dr. C. F. Hoover, of Cleveland; Drs. A. S. Warthin and Arthur Mich, *vice-presidents;* Dr. F. W. Peabody, Boston, *secretary;* Dr. T. R. Boggs, Baltimore, *recorder;* Dr. J. A. Capps, Chicago, *treasurer*, and Drs. T. B. Futcher, Baltimore, and G. C. Robinson, Nashville, *councillors.*

NEW officers of the American Society of Clinical Investigation have been elected as follows: Dr. Eugene Floyd Dubois, medical director of the Russell Sage Institute of Pathology at Cornell University, *president;* Dr. Fred M. Smith, professor of medicine, University of Iowa, *vice-president;* Dr. George A. Harrop, Jr., assistant professor of medicine, Johns Hopkins Medical School, *treasurer;* Joseph T. Wearn, of the Harvard Medical School, *secretary.*

THE second annual meeting of the Kansas Entomological Society was held at Lawrence, Kansas, on April 24. Dr. R. C. Smith, of Manhattan, was elected president for the ensuing year, and R. H. Beamer, Lawrence, secretary.

THE following officers were elected at the annual meeting of the Rochester section of the American Chemical Society, on May 3: *Chairman*, W. R. Bloor; *vice-chairman*, F. R. Baxter; *secretary and treasurer*, E. M. Billings; *executive committee:* R. J. Anderson, E. K. Carver, W. R. Webb.

AT the annual meeting of the Illinois State Academy of Science at Harrisburg, Illinois, on April 30 and May 1, Professor C. Frank Phipps, State Teachers College, DeKalb, Illinois, who has served the academy as its secretary for five years, resigned the position. The office was filled by the election of Dr. L. J. Thomas, of the department of zoology, University of Illinois.

LIEUTENANT-GENERAL SIR WILLIAM B. LEISHMAN, director-general, Army Medical Services, has been appointed a member of the British Medical Research Council. The vacancy thus filled was consequent upon the amendments to the charter which provide for an increase in the number of members from ten to eleven.

PROFESSOR J. H. TANNER has been appointed emeritus professor of mathematics at Cornell University, effective March 1 last, the day of his retirement. The board adopted, concurrently with the university faculty, a resolution of appreciation of Professor Tanner's service in the chair of mathematics.

PROFESSOR SIGMUND FREUD reached his seventieth birthday on May 6 and the occasion was celebrated by the International Psycho-Analytical Association, branches of which are now established throughout Europe, in the United States and in India. A sum of money raised by the various constituent societies of the association was presented to Professor Freud to be used by him in aid of some work or individual worker in the field of psycho-analysis, and a large number of his coworkers and associates from various countries were present in Vienna on May 6 to take part in the commemoration.

DR. GEORGE W. SEARS, of the chemistry department at the University of Nevada, has been appointed as consulting chemist in the Rare and Precious Metals Experiment Station, Bureau of Mines, Reno, Nevada.

DR. ELLERY H. HARVEY, member of the research staff of Swift and Company, has been commissioned first lieutenant in the Chemical Warfare Service.

DR. I. J. KLIGLER, formerly of the Rockefeller Institute, and for the last three years director of the malaria research unit attached to the Department of Health of the Palestine government, has been appointed head of the new department of hygiene established at the Hebrew University in Jerusalem.

DR. ROLLA B. HILL, medical adviser to the Bureau of Rural Sanitation in Porto Rico, has been selected to represent that organization in Venezuela in the same capacity; he sailed for New York on March 11, after having been the guest of honor at a luncheon tendered by the commissioner of health of the island. He will be succeeded by Dr. Florence A. K. Payne, of the International Health Board.

DR. DAVID E. FINK, of the U. S. Bureau of Entomology, formerly stationed at Riverton, N. J., is now located in the department of zoology at the University of Pennsylvania, where he will conduct physiological studies on truck crop insects.

DR. J. HARTMANN, director of the observatory of the National University at La Plata, Argentina, sailed on April 7 for several months' leave of absence in Europe. Until his return, Professor Bernhard H. Dawson, the chief astronomer, is in charge of the observatory.

DR. O. S. MORGAN, professor of agriculture in Columbia University, has been commissioned as a member of the overseas staff of the Near East Relief, with authority to represent the organization as advisory director of its agricultural, educational and reconstruction work, and will direct a survey of agriculture in Greece, Syria, Palestine, Armenia and Turkey. Professor Morgan, who has received a year's leave of absence, is now on his way to the Levant. He expects to complete the survey by Christmas.

DR. RALPH K. COLLINS, Trinidad, has arrived in Constantinople, Turkey, to make a health survey on behalf of the Rockefeller Foundation; it is planned to send a number of Turkish physicians and nurses to the United States to study American health methods.

DR. JEAN LEPINE, professor of neurology and dean of the faculty of the University of Lyons, and Dr. Albert Policard, professor of histology in the university, are visiting medical schools in this country under the auspices of the Rockefeller Foundation.

DR. GEORGE T. MOORE, director of the Missouri Botanical Garden, has returned from a trip to Central America, having visited Cuba, Jamaica, Costa Rica, Honduras and Panama. He has secured a number of additions to the garden's collections of tropical plants.

DR. FRANK M. CHAPMAN, of the American Museum of Natural History, left on April 4 for Copenhagen, as a delegate to the International Ornithological Congress, which meets from May 24 to 29. From Copenhagen Dr. Chapman will go to London to lecture before the Royal Geographic Society on "Darwin's Chile."

DR. T. WAYLAND VAUGHAN, director of the Scripps Institute at La Jolla, Calif., will attend the third Pan-Pacific Science Congress, which will be held at Tokyo, Japan, from October 27 to November 9, 1926.

DR. ELLIOT G. BLACKETT, of Boston, was the principal speaker at the twenty-ninth annual banquet of the Washington Medical and Surgical Society, on April 3. Dr. Blackett was made an honorary member of the society.

DR. LAFAYETTE B. MENDEL, professor of physiological chemistry at Yale University, gave on April 29 an illustrated lecture on "The Rôle of Proteins in Growth," at the University of Virginia.

DURING the past few months, the Hawaiian Academy of Science has been addressed by Professor Charles P. Berkey, of Columbia University, on "Evidences of Change of Climate in the Gobi Desert"; by Professor Edwin G. Conklin, of Princeton University, on "Mechanism of Evolution"; and by Professor Karl F. Meyer, of the University of California and Hooper Foundation, on "Poisoning and Infection by Food: Botulism."

DR. HARVEY W. WILEY gave an address at a meeting of the Philadelphia Forum, on April 5, entitled "Do You want to live a Little Longer?" On April 13 he addressed the over-weight students at the Wilson Normal School, Washington, D. C., on "Obesity, its Causes, Dangers and Elimination." On April 19 he addressed a meeting of the Indiana Chapter of the Sons of the American Revolution on "Our Country, its Strength and Weakness."

ANTHONY H. G. FOKKER, Dutch designer of airplanes, was a guest of the Massachusetts Institute of Technology Aeronautic Engineering Society at their annual banquet, which was held on May 12. Mr. Fokker spoke on "Modern Trend of Airplane Design in Europe and America."

DR. WALTER ERNEST DIXON, reader in pharmacology at the University of Cambridge, gave the Charles E. Dohme memorial lectures at the Johns Hopkins University on May 7, 9 and 10.

PROFESSOR SIDNEY IRVING SMITH, professor emeritus of comparative anatomy in the Sheffield Scientific School of Yale University and a member of the National Academy of Sciences since 1884, died on May 7, aged eighty-three years.

DR. EDWARD H. BRADFORD, well-known orthopedic surgeon and formerly dean of the Harvard Medical School, died on May 8 at the age of seventy-seven years.

JOSEPH LUCAS, well-known English geologist, recently died in his eightieth year.

SIR HENRY MANCE, past-president of the British Institution of Electrical Engineers and inventor of the heliograph, died on April 21, aged eighty-six years.

DR. KARL WENLE, for twenty-seven years director of the Museum of Ethnology at Leipzig, died on April 19.

PROFESSOR GEORGE B. WHAREN, head of the mechanical engineering department of the University of North Dakota, died on May 1, aged forty-two years. A correspondent writes that in 1920 he became head of the department and held that position until his death. He was one of the ablest combustion engineers in the northwest and had become an authority on the use of North Dakota lignite in pulverized form for power plant combustion. The state of North Dakota contains enormous quantities of fuel of this type, which will become one of the most valuable natural resources of the nation, when the most efficient methods for its use are completely developed. The early death of Professor Wharen is in every way unfortunate and is deeply regretted.

THE United States Civil Service Commission announces an open competitive examination for physical chemist, receipt of applications for which will close on May 25. The examination is to fill a vacancy in the Bureau of Mines, for duty at Pittsburgh, Pa., and vacancies in positions requiring similar qualifications, at an entrance salary of $3,800 a year. After the probational period of six months required by the civil service act and rules, advancement in pay may be made without change in assignment up to $5,000 a year.

THE next meeting of the Society for Experimental Biology and Medicine will be held at the buildings of the Rockefeller Institute at Princeton, N. J., on Saturday, May 22. Members and guests leaving New York City at 9:15 a. m. (daylight-saving time) will be met at Princeton Junction and taken to the Rockefeller Institute. Luncheon will be held at the Nassau Club, Princeton University, at 1:10 p. m. The scientific meeting will take place at the institute at 2:10, when papers will be read by the following members: A. M. Banta, Marion B. Sherwood, J. H. Brown, Alexis Carrel, Randolph West, Withrow Morse and J. Bronfenbrenner.

EINSTEIN'S theory of relativity in the light of the recent experiments of Dr. Dayton C. Miller will be the chief topic of discussion at a meeting to be held at the University of Indiana on May 21 and 22, under the auspices of the local chapter of Sigma Xi. Professor R. D. Carmichael, University of Illinois, and Professor H. T. Davis, Indiana University, will present the arguments in favor of Einstein, while they will be opposed by Professor W. D. MacMillan, University of Chicago, and Professor M. E. Hufford, Indiana University.

THE District of Columbia Public Health Association, which has recently been organized, held its third meeting on May 3, when Dr. James G. Cumming, of the Health Department of the District, presented a paper on the control of communicable diseases, and a report on the health needs of the national capital was rendered by a committee headed by James A. Tobey. This report contained fourteen definite recommendations for improvements. The officers of the association are: *President,* Dr. Victor C. Vaughan; *vice-presidents,* Dr. G. M. Kober and Dr. W. C. Fowler; *secretary,* Mr. James A. Tobey; *treasurer,* Miss Gertrude Bowling.

THE Kentucky Academy of Science held its annual meeting at the University of Kentucky on May 1. The officers elected were: *President,* Professor W. G. Burroughs, Berea College; *vice-president,* Dr. Henry Meier, Centre College; *secretary,* Dr. A. M. Peter, Experiment Station, Lexington; *treasurer,* Professor

W. S. Anderson, Experiment Station, Lexington. In his address the retiring president, Dr. Austin R. Middleton, of the University of Louisville, reported upon 132 essays upon evolution written by students of the department of biology. Only five held that evolution is not true. Of the remainder, 80 declared that what they had learned about evolution while at the university had strengthened their religious beliefs. Not one said that his religious belief had been affected. During the morning sessions twenty-two papers were presented in the two sections of the academy. In the afternoon a general address was given by Dr. H. H. Laughlin, director of the Eugenics Office of the Carnegie Institution at Cold Spring Harbor, on "The Principles of Eugenics."

A FEATURE of the annual meeting of the Boston Society of Natural History on May 5 was an exhibition of the 33 original water colors painted by Louis Agassiz Fuertes for Volume I of Forbush's "Birds of Massachusetts and other New England States." The society has received these noteworthy paintings as a permanent loan from the State of Massachusetts, through the kindness of Governor Fuller and Commissioner of Agriculture Gilbert. After the two remaining volumes of Forbush's work have been published, the rest of the paintings in this series (making a total of about 100) will be placed in the society's care for exhibition and preservation.

AT a recent meeting of the executive committee of the Long Island Biological Association authority was given to proceed with the construction of a new frame building for the Biological Laboratory at Cold Spring Harbor. The building will be forty-two feet long by twenty-five feet wide. It will have two floors and a well-lighted basement. Each floor is to have a clearance of about nine feet, while the basement will be about seven feet in height, and will be above ground on the side facing the harbor. The two upper floors will be occupied by the classes in field and systematic botany and comparative anatomy. The building previously devoted to botany has been renovated for use as a research laboratory. Both buildings will be available for use this summer by workers at the laboratory.

CHARLES L. FABER has presented what is said to be one of the most complete collections of Ohio fossils to the department of geology of the University of Cincinnati.

UNIVERSITY AND EDUCATIONAL NOTES

THE General Education Board has made a gift of $750,000 to the Harvard Law School endowment fund, conditioned upon the campaign committee's raising, from other sources, an additional $1,450,000.

CHANCELLOR KIRKLAND, of Vanderbilt University, has announced that $1,000,000 has already been pledged in the $4,000,000 endowment campaign now in progress. $500,000 of this amount was given by the General Education Board.

THE General Education Board has given Northwestern University $600,000, contingent on the school raising $1,400,000.

FREDERICK W. VANDERBILT and Harold S. Vanderbilt have given $500,000 for the rebuilding of the Vanderbilt Clinic at Columbia University, which was established in 1886 by the gifts of four brothers—Cornelius, William K., Frederick W. and George W. Vanderbilt. The university has also received an anonymous gift of $125,000, to be expended at the discretion of the trustees, for the benefit of the medical school.

DR. JOSEPH K. ROBERTS, of the department of geology of Vanderbilt University, has been appointed professor of geology at the University of Virginia.

THE following promotions have been made at the University of Pittsburgh: W. H. Emig, associate professor of botany; E. V. Hjort and K. S. Tesh, assistant professors of chemistry; J. S. Taylor, associate professor of mathematics. Dr. I. P. Tolmachoff, of the staff of the Carnegie Museum, has been appointed part-time professor of geology. Dr. A. E. Emerson, associate professor of zoology, has been granted a year's leave of absence to accept a John Simon Guggenheim fellowship.

THE following promotions have been made in the College of Arts and Sciences at Rutgers University: Thurlow C. Nelson, from associate professor to professor of zoology; Sidney A. Cook, from instructor to assistant professor of psychology; Arthur P. Kelley, from instructor to assistant professor of botany; Alex L. Freenlees, from instructor to assistant professor of physics, and Alan A. Boyden, from instructor to assistant professor of zoology.

THE following appointments have been made to the faculty of Clark University: W. Elmer Ekblaw, to associate professor in geography, who will continue as assistant editor of *Economic Geography;* Vernon A. Jones, to associate professor of educational psychology, and Jesse E. Bullock, to assistant professor of chemistry.

DR. R. H. THOULESS, senior lecturer in psychology at the Victoria University of Manchester, has been appointed lecturer and head of the department and laboratory of psychology in the University of Glasgow, in succession to the late Dr. Watt.

DISCUSSION AND CORRESPONDENCE

THE ALBATROSS II

THE United States Bureau of Fisheries is directing its scientific investigations more and more to the life histories of the North Atlantic food fishes, and to the fundamental oceanographic factors which govern the abundance and migrations of cod, mackerel, haddock, herring and other species.

This is work which must be done on the high seas, far from land, regardless of stress of weather: often in winter, when the ship "logs up" with freezing spray, when icy instruments numb the hands, when storm, wet and cold severely tax the crews and the enthusiasm of the scientist on board. But it is work of fundamental importance in the biological field. Since the sale of the *Albatross* in 1924, this part of the program of the bureau has been seriously hampered by the lack of a sea-going ship, neither the veteran *Fish Hawk* nor the younger *Halcyon* being safe enough for work on the offshore fishing grounds, or even near shore except in good weather; much less in winter.

All friends of the bureau who were saddened to learn of the passing of the *Albatross,* after her nearly forty years of service, will therefore rejoice to hear that she is to have a worthy successor, in the naval tug *Patuxent,* recently transferred by the Navy Department to the Department of Commerce, for the service of the Bureau, with permission to rename her *Albatross II.*

Albatross II is a first-class iron, sea-going vessel, bringing an excellent war record from the North Sea: 148 feet long; twin screw; with a speed of about thirteen tons, with low coal consumption; a very wide steaming radius; ample deck room for handling winches, nets and trawls; economical in operation. Needing only a small personnel for her operation, she could hardly be bettered for the bureau's work at sea. And her comfortable cabins and roomy laboratory will lighten scientific work on board.

Through the friendly cooperation of the Navy Department, *Albatross II* is now being reconditioned at the Navy Yard at Portsmouth, New Hampshire, the officers and men of the *Halcyon* busily cleaning and painting, while the naval machinists perform such structural repairs and alterations as are needful. At this writing (March 25) she is lurid with red lead, in anticipation of the coat of white, which all the ships of the bureau have worn for so many years.

As soon as practicable she will proceed to Woods Hole, where winches will be installed, and all the other varied fittings and apparatus needed to give her a thoroughly modern equipment, both for fishing experiments of all sorts and for oceanographic work precise enough to meet the most exacting standard.

It is hoped to commission *Albatross II* shortly after July 1, next, under the command of Captain G. W. Carlson, successively master of the fisheries schooner *Grampus* and of the *Halcyon.* For her first summer's work, the bureau plans to extend to Georges Bank and to other offshore grounds the cod-tagging campaign, which has yielded such fertile results in the coastwise waters of Nantucket Shoals and of the Gulf of Maine during the past three years; and to supplement the earlier surveys with a consistent series of oceanographic observations, much needed, for summer and autumn, in just those regions.

In anticipation of the commissioning of *Albatross II, Fish Hawk,* having outlived her usefulness, has been laid up at Woods Hole, and the same fate awaits the *Halcyon.*

Marine biologists, European and American, will join in congratulating the bureau on the acquisition of *Albatross II;* and in expecting from her scientific cruises a broadening of our knowledge of things marine which would not shame her famous namesake.

HENRY B. BIGELOW
MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASSACHUSETTS

SPERMATOGENESIS IN ICERYA PURCHASI—A CORRECTION

IN a recent study of the cytology of hermaphroditism in Icerya purchasi (S. Hughes-Schrader '25)[1] a short account of the spermatogenesis of the rare males of this species was included. The true males were described as diploid in chromosome constitution and as undergoing a perfectly normal spermatogenesis involving two maturation divisions with the reduction of the chromosomes to the haploid number. Breeding experiments under way at the time of publication have since yielded a line in which males preponderate heavily in numbers, and a cytological study of this and other new material with a restudy of the old has demonstrated clearly that I was in error in my first account. I can now state that the true males are in reality constantly haploid in constitution. A detailed investigation of the haploid spermatogenesis based on this material is now in process of publication. The diploid individuals on which my former study of spermatogenesis was based are in reality young hermaphrodites in an unusually male-like phase; a complete study has shown in each case the presence of some oogonial tissue in addition to the testes proper. The spermatogenesis in the testes of the hermaphrodite is only rarely of the type described in my 1925 paper. Normally there seems to be a transformation of a part of the germ cells of the hermaphroditic

[1] Hughes-Schrader, Sally, 1925, "Cytology of Hermaphroditism in Icerya purchasi (Coccidae)," *Zeitschf. f. Zellf. u. mik. Anat.,* B. 2.

gonad to the haploid condition and the further course of spermatogenesis then parallels that of the true males quite closely. A detailed investigation of the conditions here involved is under way.

Breeding experiments have shown further that males may arise from isolated hermaphrodites as well as from those which have been fertilized by true males. From twenty-five broods produced by hermaphrodites which had mated with true males, thirty-nine males and 2,548 hermaphrodites resulted. From sixteen broods produced by hermaphrodites which were self-fertilized only, five males and 1,839 hermaphrodites resulted. These data are exclusive of the aberrant male-producing line mentioned above—an isolated hermaphrodite which gave rise to 117 males and sixteen hermaphrodites. The males are exactly alike in general morphology and cytology whether their origin be from cross or self-fertilized hermaphrodites. Since all the eggs of the hermaphroditic ovary seem to undergo reduction it seems probable that the haploid males result from the occasional development of unfertilized eggs. Accordingly it would appear that the male is not necessary for the production of either male or hermaphrodite, although it may occasionally function in the latter case.

S. HUGHES-SCHRADER

BRYN MAWR COLLEGE

THE NOMENCLATURE OF ORGANIC COMPOUNDS

ALTHOUGH most of us are opposed to the introduction of foreign words and phrases into the language of science we frequently find ourselves resorting to such where no exact English equivalent exists. The writer has often wondered why American and English chemists have not availed themselves of the convenient French terms "function" and "functional grouping." Mr. W. T. Braunholtz, in his translation of Professor Moureu's excellent book, "The Fundamental Principles of Organic Chemistry," has done this and used the word "function" in place of "group," "radical," "linkage," etc. It would seem to be much simpler to say "ethene function," "carbonyl function," "carboxyl function" and "chlorine function," instead of "ethylene linkage," "carbonyl group," "carboxyl radical," etc., especially since we do not ordinarily speak of the "chlorine radical."

Since the word function itself suggests the chemical behavior of an element or group, it is recommended. It is convenient to speak of "functions containing nitrogen," of "functions containing sulphur," etc. On the whole, the proposed term seems to offer some advantages over the three or four words now used in our text-books.

PAUL M. DEAN

BOULDER, COLORADO

DOMESTIC CATS FOR DISSECTION

THOSE who teach comparative anatomy in colleges located in small towns, and sometimes in colleges located in larger cities, will appreciate the difficulties of securing enough cats for large classes. The difficulty became so great in Morgantown, a few years ago, that it became necessary to use rats in place of cats. Any one who has been forced to use the rat for dissection in place of the cat will appreciate the great inferiority of the smaller animal, even with the excellent outline by H. R. Hunt that has recently been published by Macmillan.

We have for the last few years secured all the cats we needed by the following means: Besides taking all cats sent to the laboratory at any time, advertisements to the effect that the department will pay fifty cents each and express charges for live, adult cats are inserted in various papers and bulletins sent to the farmers of the state. Names and addresses of those (boys on the farms, chiefly) sending in cats are kept and at the beginning of the "open season" on cats a circular letter is sent to each of those on the list.

This method not only brings in the cats, whereby the destruction of birds is incidentally reduced, but it saves the trouble that is often caused by local advertising for cats which stimulates the small boy and often the college student to the theft of the pet cats of one's neighbors.

A. M. REESE

WEST VIRGINIA UNIVERSITY

THE PROPOSED RANSOM MEMORIAL

A PROGRESS report on the B. H. Ransom memorial fund shows the interest that is being expressed in the proposition not only by Dr. Ransom's fellow countrymen but by parasitologists in numerous foreign countries where he was held in high regard. The fund has now reached the sum of $622; of this amount $121 has come from foreign countries. The latest contributions to be received from abroad are from the small country of Roumania, a prominent parasitologist of Bucharest sending his personal contribution and those of the Minister of Agriculture and the members of the laboratory of parasitology of the Faculty of Veterinary Medicine, these making a total of $20.48. A Japanese parasitologist has pledged $25 to the fund while others in Germany, France, Denmark, China, India and Canada have sent $10 or more in each case. Other countries represented are England, Switzerland, Belgium, Sweden and Italy, making a total of thirteen foreign countries.

A large majority of both foreign and American subscribers have voted that the memorial take the form of a money prize or a scholarship in parasitology. Since the fund is still inadequate for either

of these purposes, the committee has decided to postpone making a definite choice until a later date and it is hoped that American scientists who are interested in this proposition and who have delayed in making their contributions, will do so at an early date.

ELOISE B. CRAM,
Secretary, Ransom Memorial Committee
BUREAU OF ANIMAL INDUSTRY,
WASHINGTON, D. C.

SCIENTIFIC BOOKS

The Surface History of the Earth. By JOHN JOLY. Pp. 192, 13 plates, 11 text figures, and a colored oro-bathographical chart of the world. Oxford University Press, 1925.

IN this good-looking and fascinatingly written book, by an author with a wealth of imagination, we learn that the causes of the earth's changing surface features are (1) radioactivity, and (2) isostasy, both of which "are recognized to-day by most men of science as facts." Looking down the corridor of geologic time with the author, we see the earth's surface periodically heaving and subsiding, each cycle enduring about forty millions of years. There appear to have been about six of these great cycles, punctuated by the revolutions of Dana and LeConte.

This increasing and decreasing of the earth's radius is due to radioactive substances that in their disintegration are continually generating heat deep within the earth. This heat accumulates within the "substratum," which is essentially of basalt, until it attains the melting point. At present, this substratum is solid, and yet we are living on the surface of an "underworld lurid and tremendous." After sufficient heat has been generated to melt the substratum, Joly considers that the lighter continents, essentially of granitic rocks, float upon it. Then the pull of the moon sets up tidal action in the liquid basalt, the continents shift very slowly to the west, the oceans begin to spread more and more widely over the lands, due to the sinking of the latter deeper into the molten substratum, and, finally, the accumulated heat begins to discharge through the substratum (mainly through the oceans), which again congeals and in shrinking presses together the geosynclines into mountain ranges. In the author's own words: "At long intervals in the world's history the moon becomes the main source of those tides in the liquid substratum which enable the accumulated radioactive heat of the ages to escape harmlessly into the ocean, and life to survive from one revolution to the next."

The loss of heat from the basaltic substratum and its consequent change back to solidity take place, Joly thinks, in about five million years. Accordingly, the loss of heat is so slow as to affect appreciably neither the climate of the earth nor the temperature of the oceanic waters.

Then there comes a reversal of the previous state of affairs, the continents begin to rise, the transgressing seas vanish more and more, the rivers lengthen and flow out into the oceans, the greater and heavier oceanic depressions press against the smaller and lighter continents, and the weaker regions, the geosynclines, are pushed together into fold and overthrust mountains which accordingly take up most of the periodic shrinkage of the earth. In the equatorial belt this amounts to about forty miles. The mystery of it all "deepens when we are told that these great folding forces proceed from the ocean, and that their magnitudes are measured by the ocean span."

The average depth of the granitic continents appears to be about twenty miles, but they are thickest where most protuberant and in the ratio of 1 : 8.

The substratum is finally completely reconsolidated. "Great isostatic forces now act on the newly formed compensations, and the whole crushed and folded mass above rises yet higher. This final vertical movement is a characteristic event attending the close of orogenesis." However, the author makes it plain that "the mountains are not built by one grand compressional effort, but by successive efforts of a substratum whose volume changes fluctuate over long intervals of time."

It is well known that Professor Joly is distrustful of the widely accepted calculations of the age of the earth based on the present rates of downbreaking of the minerals uranium and thorium. This comes about because of his long and detailed studies of haloes (pleochroic rings) in micas, which "afford evidence of the remote antiquity of radioactivity in the earth, and of the former existence of yet other radioactive elements." Furthermore, the uranium responsible for the primary ring in the most ancient of these ancient haloes "decayed about fifty times faster than recent measurements indicate. . . . If the offered explanation is correct, it would follow that the chronological reliability of uranium-lead ratios diminishes with the antiquity of the rocks." On the other hand, thorium-lead ratios give much lower readings than do those of uranium-lead. "If thorium-lead ratios are trustworthy, we should divide the uranium-lead ages, as determined for very old rocks, by four." Accordingly, the author falls back on the rates of denudation and the sodium content in the oceans. "By making certain assumptions the sodium method may be stretched to 175 millions of years." He is even willing to stretch the age of the earth to something like two hundred to three hundred millions of years.

In the light of facts like these, the events of the past cease to be mysterious, and become the natural

outcome of the physical structure and the ceaseless change of the earth's mass. Eventually "the earth itself will have ceased to breathe. And the mind of Man, which alone comprehends it, will have become part of the forgotten past."

We congratulate the author on his inspired and inspiring work, and conclude with the advice that no geologist can afford not to make this book a part of his theoretic and basal knowledge.

CHARLES SCHUCHERT

YALE UNIVERSITY

SPECIAL ARTICLES

THE DIFFERENTIATION OF HERPETOMONADS AND LEISHMANIAS BY BIOLOGICAL TESTS

THE question of possible insect or plant hosts of the leishmanias is one of considerable practical importance in the study of the mode of infection in kala-azar, espundia and oriental sore. The identification of leishmanias among the very large number of flagellates of the herpetomonad type which live in insects and plants is, however, difficult of accomplishment by the methods hitherto employed. A new method of attacking the problem, which promises to give more reliable results, is the comparison of the serological and carbohydrate-fermenting properties of cultures of these organisms. This method has been employed with interesting results in connection with a group of herpetomonads isolated in pure culture by the writer and Miss Tilden[1] from flies, mosquitoes, milkweeds and milkweed-feeding insects. Twelve strains were cultivated, as follows:

From latex-feeding insects:	*Oncopeltus fasciatus*	1 strain
	Lygaeus kalmii	2 strains
	Oncopeltus sp.? (Peru)[2]	1 strain
From milkweeds:	*Asclepias syriaca*	2 strains
	Asclepias nivea[3]	1 strain
From mosquitoes:	*Culex pipiens*	1 strain
	Anopheles quadrimaculatus[4]	1 strain
From flies:	*Musca domestica*	1 strain
	Calliphora sp.?	2 strains

Once obtained in culture, all the strains grew well on the semisolid "leptospira" medium, yielding within 72 hours at 26° C. a layer of heavy growth 1 cm. deep. Rabbits were immunized by repeated injections of flagellates, the layer of maximum growth being pipetted off and utilized for this purpose. The results brought out by testing the effect of the various immune sera on the individual strains were of considerable interest. Among the seven strains of flagellates of milkweeds and milkweed-feeding insects, two immunologically different species were distinguished. The two mosquito strains were serologically identical, while each of the fly strains was serologically distinct. The cultures were also compared in their effect on a number of different carbohydrates, and in these tests the same relationships and differences manifested themselves which had been demonstrated by the serological reactions.

Morphologically it was impossible to differentiate the milkweed flagellates from one another, either in the plant latices or in culture, except perhaps for slight differences in size, nor could the flagellates of the different latex-feeding bugs be separated morphologically. On the other hand, it was extremely difficult to identify the characteristic twisted, ribbon-like flagellates of the plant latex with the slenderer, more actively motile insect herpetomonads with their enormously long flagella. By means of agglutination and complement fixation tests, however, it was possible to identify as a single species strains cultivated from three insects (*Oncopeltus fasciatus, Oncopeltus sp.?* (from Peru), and *Lygaeus kalmii*), and from two plants (*Asclepias syriaca* and *A. nivea*). This organism has been named *Herpetomonas oncopelti.* By the same method this flagellate species was differentiated from another which had been isolated from a second plant of the species *Asclepias syriaca* and from another individual of the species *Lygaeus kalmii;* to the latter strain the name *H. lygaeorum* has been given. *H. oncopelti* ferments 13 carbohydrates, *H. lygaeorum* ferments only 3.

The three strains of fly flagellates showed some morphological differences, but their species entity was clearly brought out by serological and fermentation tests. The house fly strain (*H. muscidarum n. sp.*) ferments 14 carbohydrates, one Calliphora strain (*H. media n. sp.*) ferments 7, the other (*H. parva n. sp.*) ferments 6.

The herpetomonads from *Anopheles quadrimaculatus* (adult) and *Culex pipiens* (larva) were found to represent a single species. This flagellate (*H. culicidarum n. sp.*) fermented most of the 17 carbohydrates tested, including amygdalin, which was not attacked by any of the others. Serologically this organism has no relation to any other strain isolated.

Cultures of *Herpetomonas ctenocephali* and *Trypanosoma rotatorium,* which were obtained through the courtesy of Dr. E. E. Tyzzer, of Harvard University Medical School, were found to be serologically different from all the other flagellates and from the

[1] In press.

[2] Obtained through the courtesy of Dr. T. S. Battistini, of Lima, Peru.

[3] Plant presented by Dr. F. O. Holmes, of the Boyce Thompson Institute for Plant Research, who had infected it by allowing infected specimens of *Oncopeltus fasciatus* to feed on the seed pods.

[4] Material obtained through the kindness of Dr. M. F. Boyd, of Leesburg, Ga.

leishmanias. They did not attack any of the carbohydrates of the series.

Leishmania tropica, L. brasiliensis, L. infantum, and *L. donovani* resemble one another in morphological features, but in serological reactions *L. infantum* and *L. donovani* proved to be very closely related. In fermentation tests the leishmanias resembled most nearly the strains isolated from blue bottle flies. No immune serum prepared with other strains had any effect on the leishmanias, nor did the leishmania immune sera have any action on the insect or plant strains.

The foregoing observations indicate unmistakably the value of serological and fermentation tests as a means of identifying the strains of flagellates; by the application of these methods it may be possible to determine the presence or absence of leishmanias in invertebrate hosts suspected of harboring them.

HIDEYO NOGUCHI

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH

GYROMAGNETIC ELECTRONS AND A CLASSICAL THEORY OF ATOMIC STRUCTURE AND RADIATION

A CHARGED sphere in rotation was shown by Maxwell as long ago as 1870 to give a uniform internal field, and an external field equivalent to that of a magnetic doublet. The writer has considered the problem of determining the fields due to a spinning electron moving with uniform velocity v making any direction with the axis of spin, taking into account the deformation or contraction of the electron boundary into an ellipsoid of axes a and $a(1-v^2/c^2)^{\frac{1}{2}}$, the short axis being in the direction of motion. Regarding this as a real, physical deformation, the energy of the electrostatic and magnetic fields, internal and external, separates into two terms, one translational, the other due to components of spin $(\omega_1\omega_2\omega_3)$. The final result is

$$T = mc^2 + \tfrac{1}{2}(A\omega_1^2 + B\omega_2^2 + C\omega_3^2) + constant \quad \ldots\ldots (1)$$

In the first term, $m = m_0/(1-v^2/c^2)^{\frac{1}{2}}$ where $m_0 = \frac{2}{3}e^2/a$ and account is taken of the boundary stresses (probably magnetic in origin) which keep the electron in equilibrium. The electrodynamic moments of inertia may be rigorously evaluated for the simple type of spinning electron considered, and in general may be expressed in powers of $\beta^2 = v^2/c^2$ in the form

$$A = I(1 + a_1\beta^2 + a_2\beta^4 + \ldots),$$
$$B = C = I(1 + c_1\beta^2 + c_2\beta^4 + \ldots) \quad \ldots\ldots (2)$$

where $I = \frac{1}{3}m_0a^2$ is the moment of inertia of the spinning electron at rest. Applying Lagrange's equations to the rotations expressed by T as kinetic energy, the precessional motion of the electron is determined by Euler's equations,

$$A_1\dot{\omega} = L_1 \qquad C\dot{\omega}_2 - (C-A)\omega_1\omega_3 = L_2 - Ck\omega_2$$
$$C\dot{\omega}_3 + (C-A)\omega_1\omega_2 = L_3 - Ck\omega_3 \quad \ldots\ldots (3)$$

$(L_1L_2L_3)$ being couples from nuclei in atomic systems, or due to the magnetic forces of the radiation field. The precessing electron has magnetic moments proportional to $(\omega_1\omega_2\omega_3)$ whose periodic variations thus give rise to electromagnetic radiation of the same frequency. The constant k is a simple type of damping factor due to the loss of rotational energy by radiation. Under no forces the stable configuration of the electron is easily seen from (3) to be with the axis of spin along the direction of motion. When disturbed the frequency of precessional motion and of emitted radiation is seen to be, if Ω_1 is the intrinsic spin,

$$2\pi\nu = \Omega_1(C-A)/C = \Omega_1(c_1 - a_1)$$
$$\beta^2(1 + b_1\beta^2 + b_2\beta^4 + \ldots) \quad \ldots\ldots (4)$$

If we denote

$$h\Omega_1 = \pi c^2 m_0/(c_1 - a_1), \quad \ldots\ldots (5)$$

where $(c_1 - a_1)$ is a numerical constant equal to $\frac{2}{3}$ for the simple model considered, we have to a first approximation a relation between *precessional electron radiation* and *velocity* in the form

$$h\nu = \tfrac{1}{2}m_0v^2, \quad \ldots\ldots (6)$$

the well-known photo-electric equation, while *Planck's constant h becomes a fundamental characteristic of a rotating electron expressed in terms of spin by equation* (5).

This purely classical interpretation appears to be the key to radiation problems generally. With similar hypotheses as to spinning protons as constituents of atomic nuclei, the theory of slightly perturbed simple orbits under an inverse-square law of electrostatic attration from the nucleus, with the fundamental relations (6), leads to the series formula for hydrogen and helium spectra and in more complex cases to the S,P,D and F series, with the correct value for the Rydberg constant. Perturbations of orbits due to variation of mass with velocity, external electric and magnetic fields, with in some cases slightly different interpretations, lead to formulae the correct type for fine structure, Zeeman (normal and anomalous) and Stark effects. The fundamental formula (6), used in conjunction with a Maxwellian distribution of electron velocities, also leads with reasonable hypotheses as to electron orbits in a space lattice to Planck's formula for black-body radiation and the associated formulae for specific heats.

LOUIS V. KING

MCGILL UNIVERSITY

THE NATIONAL ACADEMY OF SCIENCES

(*Continued from page 486*)

Bread moulds and biochemical differences between sexes: DR. ALBERT F. BLAKESLEE (introduced by C. B. Davenport).

In the bread moulds (Mucors), a group of fungi with a simple but distinct type of sexual reproduction, the opposite sexes have been called (+) and (−) since, on account of their similarity in appearance, it was not possible to determine surely which was male and which female. Since in the bread moulds the sex cells are equal in size and the developing offspring are apparently nourished equally by the two sexes, these forms are especially adapted to a study of the fundamental differences between sexes. Their physiological behavior had early led to the belief that there must be a biochemical basis for sex differentiation in these and other forms.

Investigations, carried on by Miss Sophie Satina and the writer, under support of the Committee of the National Research Council for research on sex problems, show that males and females of higher and lower plants have average differences in response to biochemical tests, the female usually being the more active chemically. The test for sexes in human beings, devised by the Russian investigator Manoilov, we have found also applicable to plants and over 90 per cent. of correct identifications of sex have been obtained in different groups by use of this test.

The (+) sex of bread moulds has been found to react biochemically like females and the (−) sex like males of higher plants and animals.

An exhibit installed in the National Academy building shows cultures of sexual forms of bread moulds and some of the biochemical tests of sex in these fungi and in green plants.

Changes of structure due to a modified environment: A study of labile protoplasm in Helianthus Annus L.: ERWIN F. SMITH.

This paper details the experimental production in the common sunflower (by irritation of young meristematic tissues) of (1) ray flowers and supernumerary capitula (sessile or stalked) in the midst of tubular flowers; (2) of extensive cavities (cysts) in the stem-pith lined with a fine-celled tissue bearing numerous trichomes (hairs) like those on the surface of the plant; (3) of pith bundles, often fused into one or more long cylinders (steles) of wood and bast, produced in the center of the pith subtending the cavities and always with a reversed polarity; and (4) of roots and linear bracts produced in the floral parts.

These results were first obtained by inoculating the crowngall organism (*Bact. tumefaciens*) into young flower heads and so far this method has given the most numerous and striking examples, but the same results, exclusive of the supernumerary capitula, were obtained in a smaller number of instances from simply dislocating tiny fragments of tissue of the receptacle by means of repeated needle punctures.

The results show that cysts are independent of tumor formation, but in case of the bacterial inoculations the walls of the cysts bore numerous tumors which were either discrete or fused over long distances. These crowngalls frequently filled the cyst cavity and stretched it, often rupturing its walls to appear on the surface of the stem. My experiments were made in 1923–24, and were repeated on a larger scale in 1925 with the same results. It is the first time I have observed cysts in connection with crowngalls.

The striking structural modifications I have obtained are one more example of the potent influence of a changed environment. This, however, is active in the sunflower only on young cells. Nothing can be done with mature or semi-mature tissues.

Indications respecting the colloidal behavior of the agency of virus inducing mosaic disease of tobacco (illustrated): B. M. DUGGAR (introduced by Erwin F. Smith).

Mutations in Fusarium and their effect upon the species concept (illustrated): LEON LEONIAN (introduced by Erwin F. Smith).

Some modifications of the mononuclear white blood cell: WARREN H. LEWIS (introduced by John C. Merriam).

When simple hanging drops of blood are cultivated outside the body the mononuclear blood cells become greatly altered in appearance. Some of them ingest numbers of red blood cells and become macrophages similar to those scattered throughout the body. Others ingest only fine material, which becomes concentrated about the centriole into a central area, and becomes epithelioid cells similar to those in tuberculous lesions. Mononuclear blood cells probably undergo similar changes in the body. The tumor cell, in one variety of rat-sarcoma, is a modified mononuclear white blood cell of the epithelioid type. Puré cultures of such tumor cells, when inoculated into a rat, reproduce the tumor. Cultures from the latter behave like those from the original tumor.

The effects of X-rays upon regeneration in planarians: PROFESSOR WINTERTON C. CURTIS and JANE HICKMAN (introduced by L. J. Stejneger).

In work reported before the American Society of Zoologists at the Washington Meeting, December, 1924, (Curtis and Schulze) and before the Kansas City Meeting of the American Association for the Advancement of Science, December, 1925 (Marion F. Isely), it has been shown by the writer and his students that there exist in the parenchyma of various species of planarians formative cells that are apparently responsible for the changes observed during regeneration. Not all planarians have the great regenerative power that is possessed by species like P. maculata and P. agilis. Some, like Dendrocœlum lacteum, have relatively little capacity for

regeneration and the process takes place at a very slow rate. Comparison of the histological structure in these two extreme cases shows that P. maculata has an abundance of formative cells which are active in regeneration, while there are few such cells in D. lacteum. Other species, like Phagocata gracilis, exhibit an intermediate number of these cells. As was stated at the Kansas City meeting, we believe that by examining the parenchyma and determining the abundance of formative cells one can foretell the probable power of regeneration in a planarian; and, conversely, that knowing the power of regeneration in any species he can foretell the relative abundance of the formative cells.

In further analysis of this relation between the formative cells and regeneration, experiments are being conducted with the X-ray which have thus far been confined principally to P. agilis, but are being extended to P. velata in which similar results are being obtained. These experiments were suggested by the well-known effects of X-rays upon the tissues of higher organisms. In the treatment of cancer and in various experimental studies it has been ascertained that the X-rays give a differential killing of various tissues in the following order of susceptibility: Germ cells, lymphoid tissue, vascular endothelium, cartilage. Since, in the higher animals, *germ-cells* and *cells of an embryonic type* are, therefore, highly susceptible, it was thought that the formative cells of planarians, *which are embryonic and germinal,* might react in a similar manner. *Such appears to be the case.*

When specimens of P. agilis are cut transversely into head-, middle-, and tail-pieces of about equal bulk, and given X-ray treatment equivalent to from 2 to 16 skin units, as the term is used in medical practice, *they fail to regenerate the external features necessary for a normal individual, while internally they show what seems a complete destruction of the formative cells.* The same result is obtained whether the treatment is given at one time or as series of exposures. If given as a series of exposures, more or less normal heads are formed on all pieces, but later these heads degenerate. If given at one time, there are no "real" heads formed, although there may be some indications of eyes. Exposure without cutting results in the degeneration of the head. Cutting before treatment or within 24 hours after exposure produces entirely similar results. Histologically, the result seems to be about the same in any of the above forms of treatment. There is perhaps a better chance for the survival of some of the formative cells in worms that are treated before cutting than in specimens which are cut and then traced (microphotographs illustrating these changes will be shown as lantern slides). Studies of the exact cytological and histological changes involved in the destruction of the formative cells are being undertaken; and also of the nature of the individual that survives such treatment.

One series of experiments upon P. velata shows that the treatment likewise destroys the power of regeneration in this species. The cells in P. velata that we interpret as formative cells are smaller and more difficult to recognize as such than in P. maculata and P. agilis. Nevertheless, so far as the observations have gone, they indicate that this type of cell disappears. Further experiments upon P. velata are in progress and others upon hydra.

An experiment with radium is now in progress.

As to the possible extensions of such work, we believe that similar results may be looked for in the regenerative processes of other invertebrates, particularly the porifera, cœlenterata, and annulata. It is hoped to begin such investigations at the Marine Biological Laboratory during the coming summer. If the same principle holds for the cells of planarians as for those of the higher vertebrates, there is reason to believe that it may extend from one end of the animal kingdom to the other.

Moreover, our observations upon what we regard as the formative cells of P. velata lead us to hope that the X-ray treatment may be used as a method of technique in cases where the histology of regeneration is obscure, with the result that some one type of cell may be destroyed, and thus shown to be essentially related to the regenerative processes.

It is also possible that such technique may be utilized for the early detection of germ-cells in the development of various organisms.

Whatever may be the results of these extensions, it is believed that certain clues have been obtained to the histology of regeneration in planarians; and that a new method of technique has been indicated for the study of such problems in the lower invertebrates.

The human growth curve: DR. CHARLES B. DAVENPORT.

The development curve of human body weight is neither a straight line, as it would be were increments arithmetical, nor of the simple autocatalytic type since the locus of maximum velocity is not at the middle of the curve but there are two loci near the ends. The curve of annual increments of weight reveals that the curve of growth is composite and, indeed, consists apparently of three autocatalytic curves of which the loci of maximum intensity are, in the male, at birth, at 15 years, and probably at about 8 years. The third maximum is masked by the vigor of the other two periods of active growth which are superimposed upon the extremities of the third. An analysis of the curve of annual increments of weight into three binomial curves of very different standard deviation provides us with a full explanation of the irregularities of the development curve. The third growth cycle is not the same as Robertson's which seems to be based upon a statistical irregularity which disappears on the accumulation of additional data.

The interpretation of the three cycles of growth remains uncertain. The first and the second correspond closely with the greatest activity of the thyroid and pituitary glands, respectively, whose hormones are primarily growth stimulating. The third cycle of growth is a fundamental one underlying the others, and probably represents some more general growth stimulus exerted from the time of the fertilization of the egg to the time of growth cessation.

(To be concluded)